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A systematic approach for improving the quality of official statistics: Case of Korean information and telecommunication industry

So Young Sohn [a,*], In Sang Chang [b,1], Tae Hee Moon [c,2]

[a] Department of Information and Industrial Engineering, Yonsei University, 134 Shinchon-dong, Seoul 120-749, Republic of Korea
[b] Korea Productivity Center (KPC), 122-1 Juksun-Dong, Jongro-Gu, Seoul, Republic of Korea
[c] Centre for Technology Management (CTM), Institute for Manufacturing (IFM), University of Cambridge, Mill Lane, Cambridge CB2 1RX, UK

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ABSTRACT

With the rapid growth of information and communication technology (ICT) in Korea, there was a need to improve the quality of official ICT statistics. In order to do this, various factors had to be considered, such as the quality of surveying, processing, and output as well as the reputation of the statistical agency. We used PLS estimation to determine how these factors might influence customer satisfaction. Furthermore, through a comparison of associated satisfaction indices, we provided feedback to the responsible statistics agency. It appears that our model can be used as a tool for improving the quality of official ICT statistics.

1. Introduction

Today, globalization, deregulation, and innovation are propelled by information and communication technologies (ICT) and are they are changing the economic landscape [29]. For effective decision-making, the quality of ICT statistics is important. However, rapid changes often complicate the generation of high quality official statistics. One problem is the lack of a standardized ICT classification system; also there are few experts familiar with both ICT applications and statistics.

In order to achieve high quality official statistics, Sung [30] emphasized the importance of effective operation of the statistical agency by applying TQM. Helenius and Liewendahl [9] emphasized two important components: grasping customer's needs and training staff according to them. In addition, Lee and Sohn [23], Haworth [8], and Sonnberger and Linden [28] assessed the statistical quality programs of their own country and suggested ways for improvement. According to Eurostat [5], deterioration of statistics quality is related to several sources of error: sampling, coverage, measurement, processing, and non-response. However, most approaches are based on forming check lists or arguing opinion rather than determining satisfaction of customer need. In order to manage the level of quality of, a more systematic approach is required.

In Korea, KAIT (Korea Association of Information & Telecommunication) is the responsible agency that compiles eight kinds of ICT-related official statistics about the conditions of the industry, the state of its employment, and trends in the ICT market [10–17]. However, the users have not been sure that the official statistics were accurate and reliable and thus the responsible agency became concerned with monitoring the level of statistics quality, understanding customers' needs, and improving data quality. Our goal was to suggest a systematic method for resolving these concerns.

The quality of official statistics is dependent on the data collection procedure, data processing procedures, result reporting, etc. We used a systematic method based on SEM (the structural equation model), considering the relationships between the quality dimensions to increase the quality of official statistics.

2. Literature reviews and research hypotheses

2.1. Quality components of official statistics

A number of national and international official statistical agencies have given their definition of *quality of official statistics*,

* Corresponding author. Tel.: +82 2 2123 4014; fax: +82 2 364 7807.
E-mail addresses: sohns@yonsei.ac.kr (S.Y. Sohn), ischang@kpc.or.kr (I.S. Chang), thm29@cam.ac.uk (T.H. Moon).
[1] Tel.: +82 2 398 4367; fax: +82 2 398 4369.
[2] Tel.: +44 1223 339816; fax: +44 1223 766400.

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Table 1
Summary of quality dimensions used by agency supplying official statistics

	Korea	Canada	Netherland	Eurostat	IMF
Relevance	X	X	X	X	X
Accuracy	X	X	X	X	X
Timeliness	X	X	X	X	X
Accessability	X	X	X	X	X
Comparability	X	X	X	X	
Efficiency	X	X		X	
Completeness				X	

X indicates that the component is considered by the agency or country.

and agree that it is associated with multi-dimensional elements, including relevance, timeliness and accessibility, and accuracy. They generally also share the view that *improving quality results in greater utility of statistical products and services*. In addition, they understand that some components conflict (e.g. accuracy vs. timeliness). Table 1 summarizes the frequency with which each component has been used [22] by various countries.

Some components (accuracy, relevance, timeliness, and accessibility) have been addressed by all and others (efficiency, completeness, and coherence) by some. In order to improve the quality of official statistics, the American Statistical Association [1] emphasized the importance of organizational processes such as questionnaire design, sampling, data collection, data processing, and analysis. Jones [20] suggested three guidelines: employ more experienced and professional statistical assessors; ensure statistical coauthorship or validation by an expert before submission; prepare unified statistical guidelines. In summary, these dimensions are focused on gathering and processing data rather than reflecting customer needs.

Blackstone [2] commented that managing the accuracy of official statistics required that it was accessible, interpretable, and coherent. We therefore used a structural equation model to determine the relationships between quality components of official statistics to meet customer needs.

2.2. Structural equation model and research hypotheses

Although the quality of official statistics is multi-dimensional, we found no prior research that considered the structural relationship among the various factors that potentially influence customer perception of satisfaction [3,6,18], loyalty, etc. In the area of marketing, the gap between quality perception and expectation was investigated using SERVQUAL [24] or SERVFERF [4]. In a more sophisticated approach, SEM was used to examine the relationship between recognized quality attributes [7,27,31].

SEM consists of two types of equations: measurement and construct [21]. The former is used to study the relationship between observed variables and latent factors, the latter to assess the hypothesized relationship among the latent factors [19,25]. In our study, SEM was first applied to improve the quality of the ICT official statistics in Korea. Then, it was used to determine the structural relationships among various factors such as survey, processing, and output quality, the reputation of the survey institution, and customer perception of the output.

2.2.1. The measurement variables

The survey quality was measured in terms of three factors: adequacy of the survey form, coverage of the ICT industry, and determination of system of survey error, survey purpose, and delivery of notices or cautions to responders.

The processing quality was then measured using four aspects of accuracy depending on the variables in Table 1. Output quality was measured by analysis of published reports and original raw data in an online website. The quality of publication reports considered

Table 2
Quality factors and measurement variables of SEM

Latent variable	Measurement variable
Survey form quality	Adequacy of survey form
	Adequacy of survey coverage
	Adequacy of ICT industry classification
	Adequacy of check system of survey error
	Adequacy of survey purpose
	Adequacy of delivery of notices or cautions
Accuracy	
Survey	Adequacy of a population
	Adequacy of sampling
Processing	Adequacy of collecting data
	Adequacy of processing
	Adequacy of examined statistics
Timeliness	Degree of acquaintance for date of issue
	Degree of observance for date of issue
	Adequacy of time interval between survey starting data and publication issue date
	Adequacy of the distribution time (time to distribute)
Comparability	Comparability over time
	Spatial comparability
Accessibility	Statistic data are easily accessible by users
	Statistic data are available in the forms users desire and are adequately documented
	Assistance in using and interpreting the statistics
Output quality	
Reports quality	Design
	Color
	Ability to provide with information
	Font and size of letter
	Degree of reflection to customer needs
	Degree of utilization of data to promote understanding
	Degree of ability to provide with various analysis results
Web quality	Adequacy of data type offered in web
	Degree of security of Web
	Speed of data transmission
	Degree of stability
	Degree of convenience web design
Reputation of survey institution	
Reliability	Competitiveness
	Capability
	Adequacy of the number of members
	Degree of know-how of member
Customer care	Degree of provided customer care
	Degree of effort to respond customer's needs
Customer satisfaction	General satisfaction degree
	Satisfaction degree of statistics quality
	Satisfaction degree of report
	Satisfaction degree of web service
	Satisfaction degree for the quality of ICT statistics compared with ideal statistic quality
	Degree of satisfaction compared with expected quality
Loyalty	Recommendation for the reports and data
	Willingness to pay (currently, the report is a free service.)
Complaint	Measured complaint (include complaints due to errors in results)